The range of attraction for light traps catching Culicoides biting midges

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The range of attraction for light traps catching *Culicoides* biting midges

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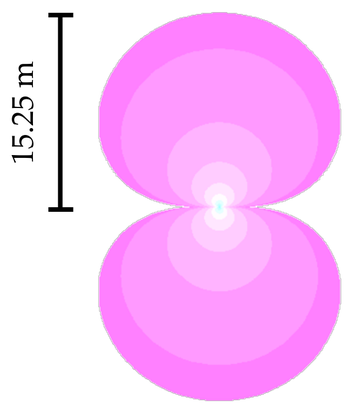
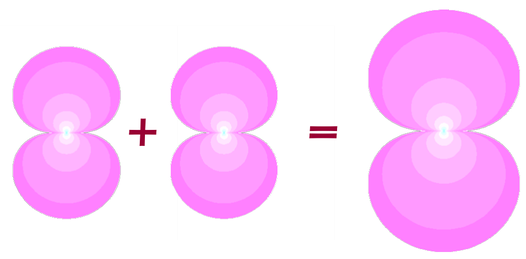
View from above: The light tube generates an asymmetric light-field around a trap.

Lighter colors indicate higher light intensity.



Conclusion

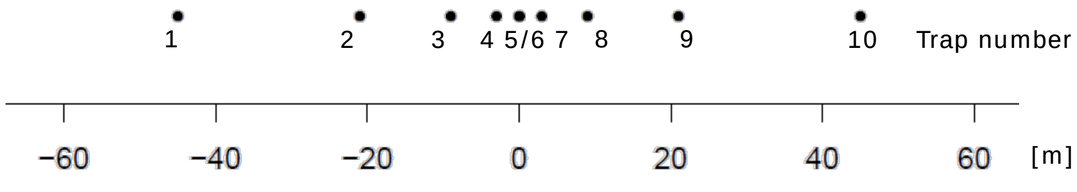
We present a model that explains observed catches of *Culicoides* by assuming that they evaluate light sources in the horizon and fly towards the perceived strongest source of light. The model implicates that the range of attraction for a light trap is dependent on the intensity of the light emitted from the trap. Furthermore, traps placed closely together will collaborate to attract *Culicoides* from farther away. The maximum range of attraction for a single 4W CDC light trap is estimated to 15.25 meters.



Two traps in the same location results in increased light intensity and therefore also increased range of attraction.

Experiment

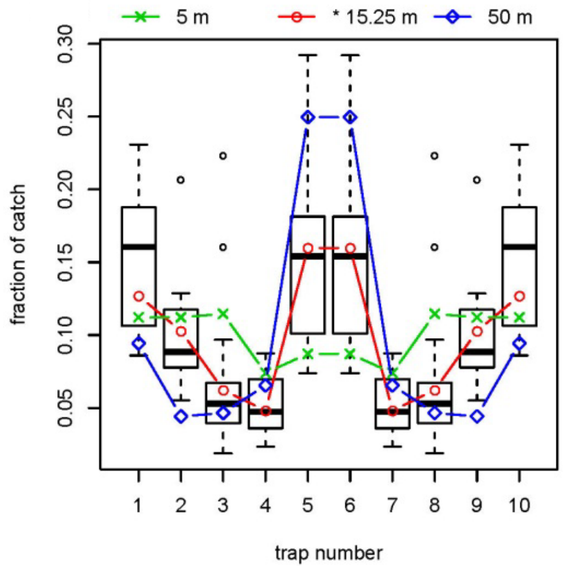
10 light traps were placed on a line in a symmetric pattern with less distance towards the middle.
In total 10,150 *Culicoides* were caught in 242 individual trap catches in 16 catch periods of one hour.
Surprisingly the two central traps caught the highest fractions of *Culicoides*.



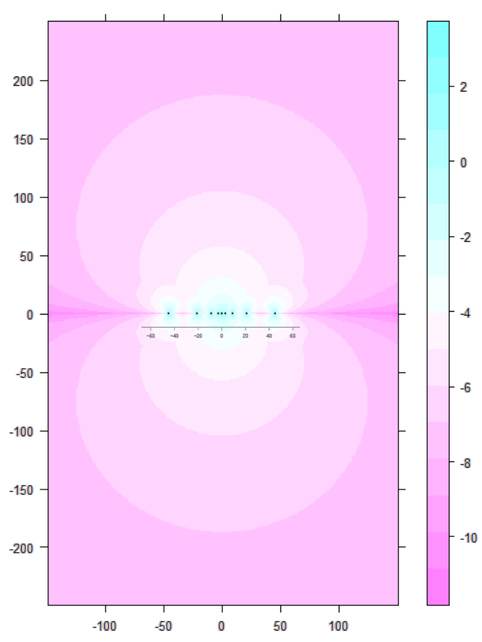
Result

Data was transformed to fraction of catch per catch period, thus avoiding influence of fluctuations in the level of abundance.
The symmetrized experimental data is plotted as a boxplot with fractional catch as a function of trap number.

The red line shows the best fit of the model to the data, where the maximum range of attraction for a single trap is estimated to be 15.25 m.



Model

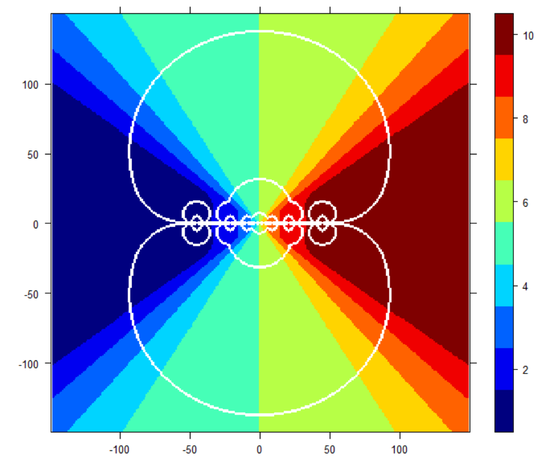


We developed a simulation model to fit the observed experimental data. The model simulates the flight of Culicoides towards the light traps. The light intensity from the traps is calculated up to at least 100 m away from any trap. Included in this calculation is that light is emitted asymmetrically from the light tubes in the traps.

Left figure: The experimental field visualized from above, with trap locations indicated by black dots: The colors show the maximum perceived light intensity by the *Culicoides* around the transect of light traps.

The direction of flight for each *Culicoides* is determined by the direction where they perceived the brightest light to originate, which most often is not in a straight line towards the traps.

Right figure: The experimental field visualized from above: The catch area for each trap is marked with an individual color. The center traps catch *Culicoides* from a large area because of the synergistic effect. The white lines represent the three different light intensity cutoff values used to determine the fits in the 'Result' figure.



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Background picture is of the experimental setup
Taken by: Carsten Kirkeby

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It calculates catch from a setup of traps that you decide.